Goniophotometry Report

1_PHOT_NINETY-NINE-2000lmChip-2700K-Spreader-HoneycombLouvre_2303
www.factorylux.com

Tested Light Source - 1_PHOT_NINETY-NINE-2000lmChip-2700K-Spreader-HoneycombLouvre_2303

Laboratory and Equipment

Laboratory Owner and Location	Factorylux, Greenhill Mills, Hebden Bridge, HX7 5QF, UK
Goniospectrometer System and Type	BaseSpion – Type C, horizontal
Spectrometer Manufacturer and Model	Ibsen Photonics, Denmark – Freedom VIS (Custom Viso)

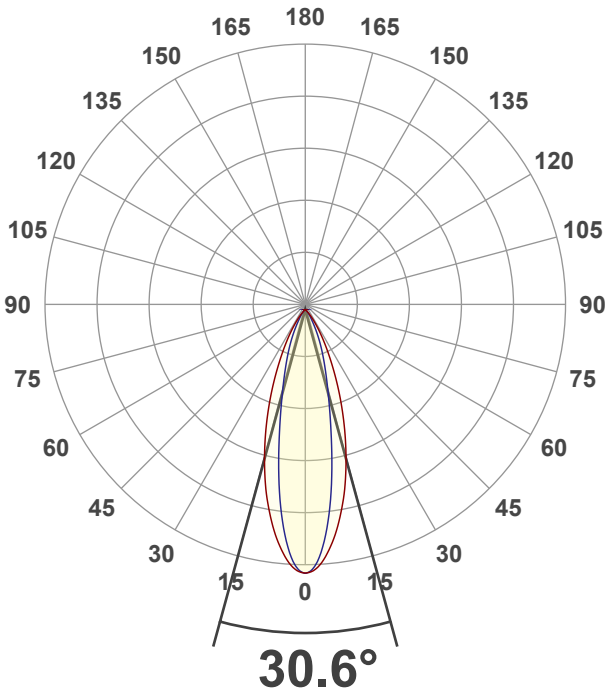
Measurement Conditions

Number of C-planes and Resolution	32 planes – 11.25°
γ (gamma)-Resolution	1°
Test Distance	1.50 m
Input Power, Power and Displ. Factors	15.8 W – PF 0.98 – DPF 0.98
Input RMS Voltage and Current	242 V – 0.067 A
Frequency of Input Power	50 Hz

Main Light Measurement Results

Output	863 lm
Efficiency	55 lm/W
Peak Intensity and Beam Angle	2311 cd – 30.6°
Color Rendering Index	CRI 92.8

Light Intensity Distribution



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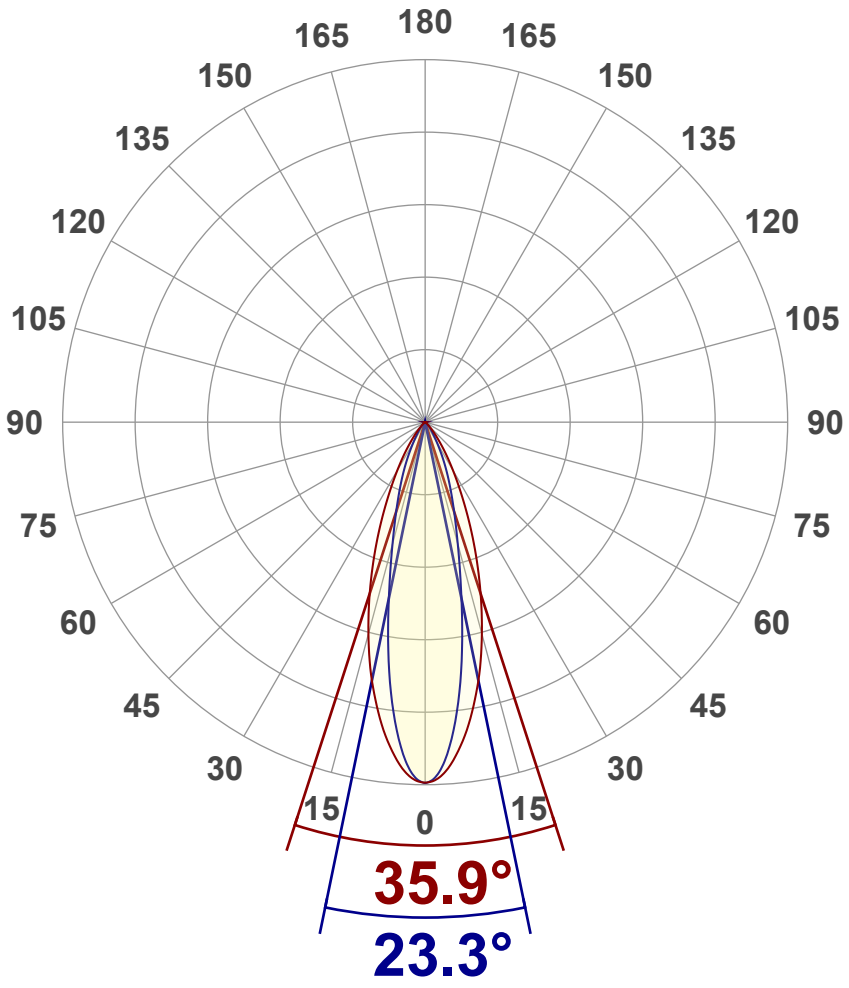
Luminous Intensity diagram

Unit: 0-100% of peak intensity



Main Values

Output (total Lumen)	863 lm
Peak Intensity	2311 cd
Beam Angle (50%)	30.6°
Beam Angle (90%)	23.3°
Beam Angle (10%)	41.8°

Cut-off Angle

Average 2,5%	80.5°

Field Angle

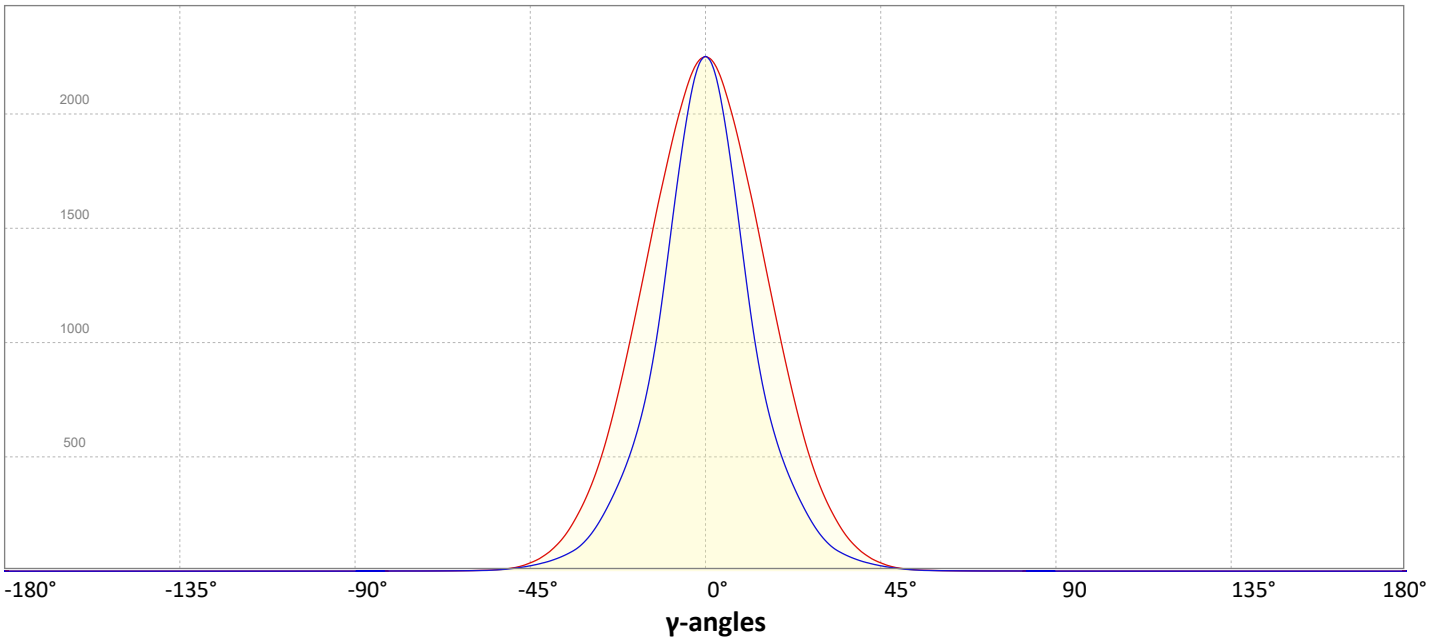
Average 10%	61°

Intensity Ratio

In 120° cone	99.6%
In 90° cone	98.0%

C000-C180
C090-C270

Linear distribution diagram - Intensity (candela) vs γ-angle



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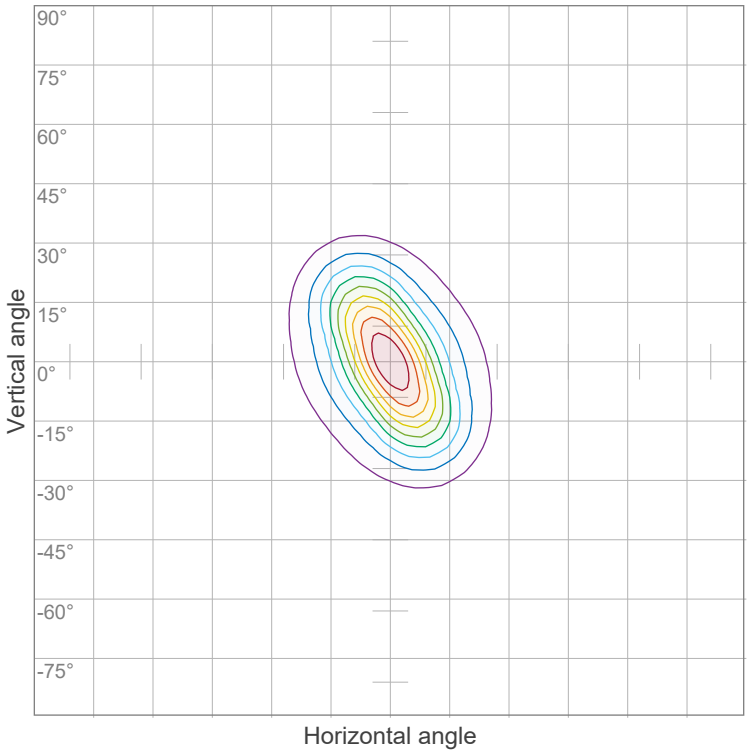
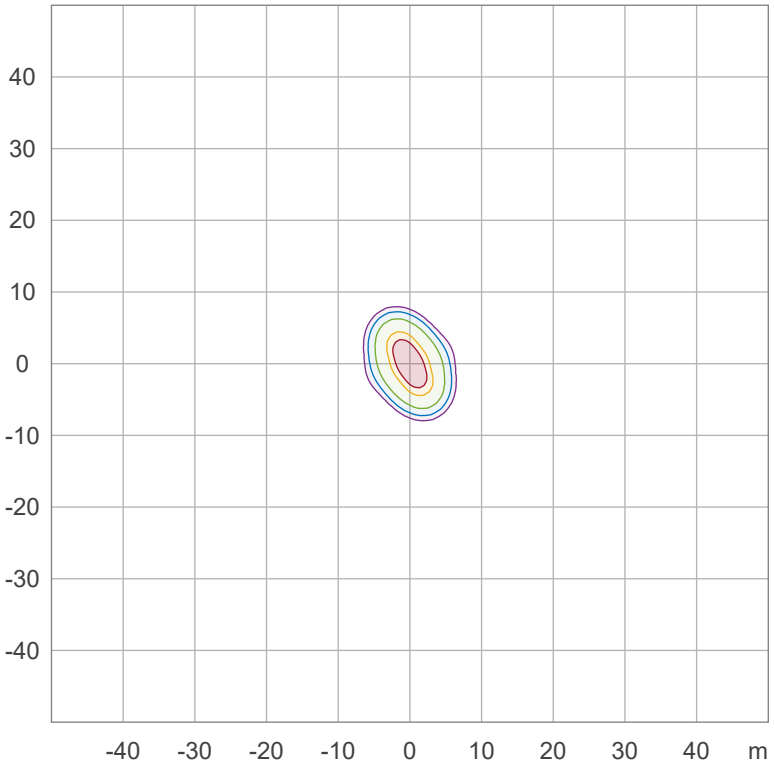
Iso-intensity Diagram (Iso-candela)



90 %	2077.6 cd
80 %	1846.7 cd
70 %	1615.9 cd
60 %	1385.1 cd
50 %	1154.2 cd
40 %	923.4 cd
30 %	692.5 cd
20 %	461.7 cd
10 %	230.8 cd

Peak intensity: 2308.4 cd
Number of c-planes: 32

Iso-illuminance Diagram (Iso-lux)



50.0 %	11.5 lx
30.0 %	6.9 lx
10.0 %	2.3 lx
5.0 %	1.2 lx
3.0 %	0.7 lx

Peak illuminance: 23.1 lx
Mounting height: 10.0 m
Number of c-planes: 32

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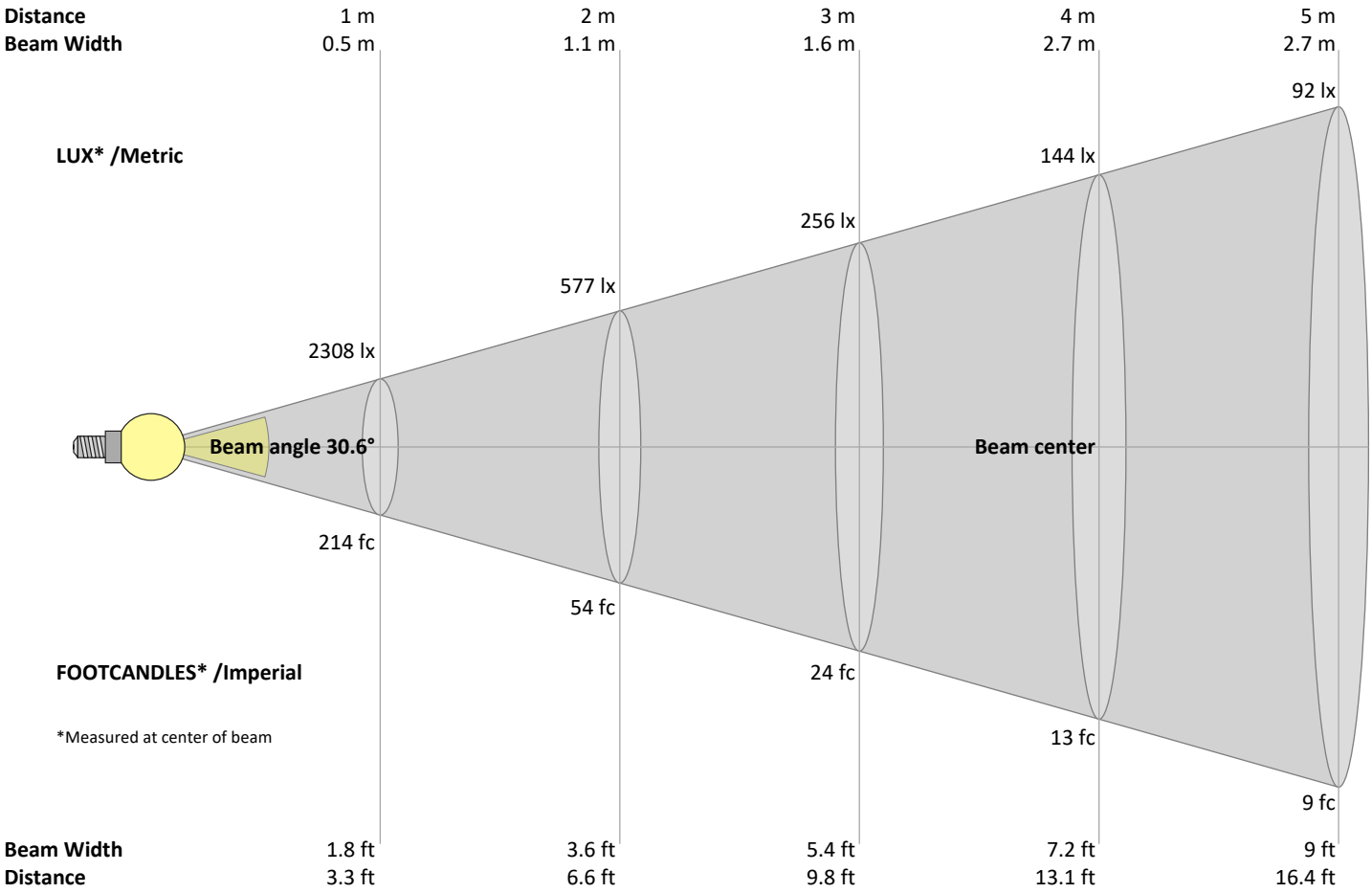
Beam Details



Beam intensities from 1 – 20 m

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	m
3.3	6.6	9.8	13.1	16.4	19.7	23	26.2	29.5	32.8	36.1	39.4	42.7	45.9	49.2	52.5	55.8	59.1	62.3	65.6	ft
2308	577	256	144	92	64	47	36	28	23	19	16	14	12	10	9	8	7	6	6	lux
214.5	53.6	23.8	13.4	8.6	6	4.4	3.4	2.6	2.1	1.8	1.5	1.3	1.1	1	0.8	0.7	0.7	0.6	0.5	fc

Intensities in 0° c-plane

0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	32°	34°	36°	38°	γ
2308	2287	2214	2103	1972	1821	1664	1493	1319	1149	985	829	686	558	449	358	282	217	163	121	cd
100%	99%	96%	91%	85%	79%	72%	65%	57%	50%	43%	36%	30%	24%	19%	16%	12%	9%	7%	5%	of 0°val

Intensities in 90° c-plane

0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	32°	34°	36°	38°	γ
2308	2260	2113	1898	1643	1369	1111	898	730	600	494	406	329	261	201	153	117	91	73	58	cd
100%	98%	92%	82%	71%	59%	48%	39%	32%	26%	21%	18%	14%	11%	9%	7%	5%	4%	3%	2%	of 0°val

Intensities in 180° c-plane

0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	32°	34°	36°	38°	γ
2308	2287	2214	2103	1972	1821	1664	1493	1319	1149	985	829	686	558	449	358	282	217	163	121	cd
100%	99%	96%	91%	85%	79%	72%	65%	57%	50%	43%	36%	30%	24%	19%	16%	12%	9%	7%	5%	of 0°val

Intensities in 270° c-plane

0°	2°	4°	6°	8°	10°	12°	14°	16°	18°	20°	22°	24°	26°	28°	30°	32°	34°	36°	38°	γ
2308	2260	2113	1898	1643	1369	1111	898	730	600	494	406	329	261	201	153	117	91	73	58	cd
100%	98%	92%	82%	71%	59%	48%	39%	32%	26%	21%	18%	14%	11%	9%	7%	5%	4%	3%	2%	of 0°val

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Light Planning – UGR table

Uncorrected, comprehensive UGR table according to 117-1995

Reflectances											
	ρ Ceiling	70	70	50	50	30	70	70	50	50	30
	ρ Walls	50	30	50	30	30	50	30	50	30	30
	ρ Floor	20	20	20	20	20	20	20	20	20	20
Room size H = mounting height above eye level											
X	Y	**Viewed Crosswise** (Viewing direction orthogonal to lamp length axis)					**Viewed Endwise** (Viewing direction parallel to lamp length axis)				
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Variations with the observer position for the luminaire spacings, S:

n/a	n/a	n/a
n/a	n/a	n/a
n/a	n/a	n/a

UGR data could not be calculated due to missing/wrong symmetry. Goto Edit->Photometric->Corrections and select Correct asymmetry.

Coefficients of Utilization

Ceiling reflectance	80			70			50			30			10			0		
Wall reflectance	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
Floor reflectance	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	0
RCR	(RCR: Room Cavity Ratio)			Room Values are expressed as percentage of Lumen delivered to the task surface														
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	114	112	110	108	112	110	108	106	106	104	103	102	101	99	98	97	97	95
2	109	105	102	99	107	104	100	98	100	98	95	97	95	93	95	93	92	90
3	105	99	95	92	103	98	94	91	95	92	89	93	90	88	91	89	87	85
4	101	94	89	86	99	93	89	85	91	87	84	89	86	83	87	85	82	81
5	97	89	84	81	95	89	84	80	87	83	80	85	82	79	84	81	78	77
6	93	85	80	76	91	84	80	76	83	79	76	82	78	75	80	77	75	73
7	89	81	76	73	88	81	76	72	79	75	72	78	75	72	77	74	71	70
8	86	78	73	69	85	77	72	69	76	72	69	75	71	68	74	71	68	67
9	83	74	69	66	82	74	69	66	73	69	66	72	68	66	72	68	65	64
10	80	71	67	63	79	71	66	63	70	66	63	70	66	63	69	65	63	62

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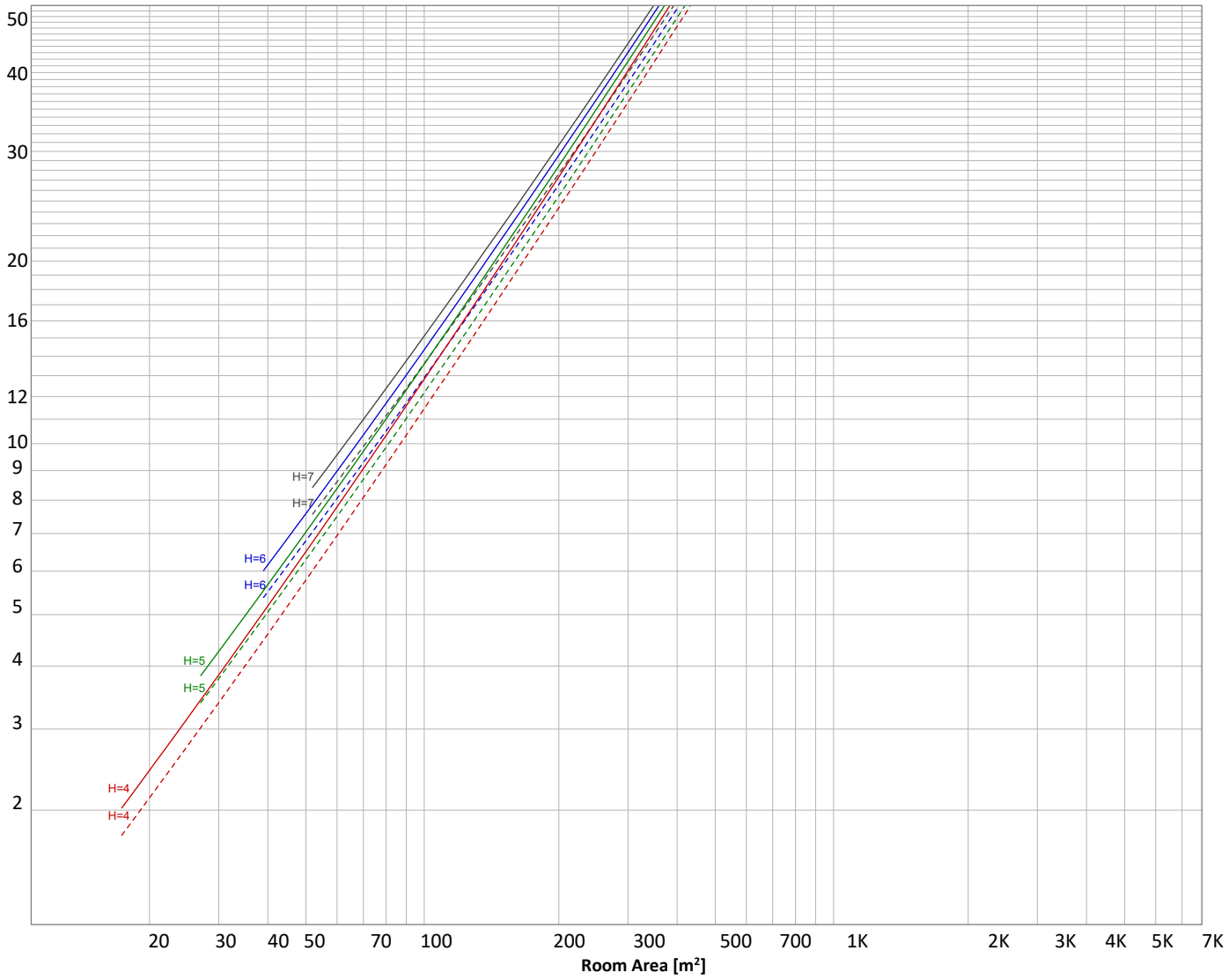
Luminaire budgetary diagram

Uncorrected, comprehensive UGR table according to 117-1995

LAMPS (number of lamps)



Conditions

H = Room height	Flux = 863 lm
H_{down} = Lamp distance from ceiling =	0.00 m
H_{work} = Work area height from floor =	0.00 m
E_{work} = Average lux on work area =	100 lx

	ρ(%)		
Line type	Ceiling reflectance	Wall reflectance	Floor reflectance
----------	70	50	30
————	50	30	20

Zonal Lumen Summary

0°-10°	10°-20°	20°-30°	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°
183 lm	315 lm	229 lm	99.3 lm	28.1 lm	4.64 lm	1.41 lm	0.781 lm	0.630 lm

90°-100°	100°-110°	110°-120°	120°-130°	130°-140°	140°-150°	150°-160°	160°-170°	170°-180°
0.252 lm	0.242 lm	0.227 lm	0.205 lm	0.081 lm	0.000 lm	0.000 lm	0.000 lm	0.000 lm

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Outdoor Light Planning

Lumen per Zone

Zone (γ)	Lumen	% Total
0-10°	183 lm	21.2%
10-20°	315 lm	36.5%
20-30°	229 lm	26.6%
30-40°	99 lm	11.5%
40-50°	28 lm	3.3%
50-60°	5 lm	0.5%
60-70°	1 lm	0.2%
70-80°	1 lm	0.1%
80-90°	1 lm	0.1%
90-100°	0 lm	0.0%
100-110°	0 lm	0.0%
110-120°	0 lm	0.0%
120-130°	0 lm	0.0%
130-140°	0 lm	0.0%
140-150°	0 lm	0.0%
150-160°	0 lm	0.0%
160-170°	0 lm	0.0%
170-180°	0 lm	0.0%
Total	863 lm	100.0%

Zonal Lumen summary

Zone (γ)	Lumen	% Total
0-30°	727 lm	84.3%
0-40°	826 lm	95.8%
0-60°	859 lm	99.6%
60-90°	3 lm	0.3%
70-100°	2 lm	0.2%
90-120°	1 lm	0.1%
0-90°	862 lm	99.9%
90-180°	1 lm	0.1%
0-180°	863 lm	100.0%

BUG rating

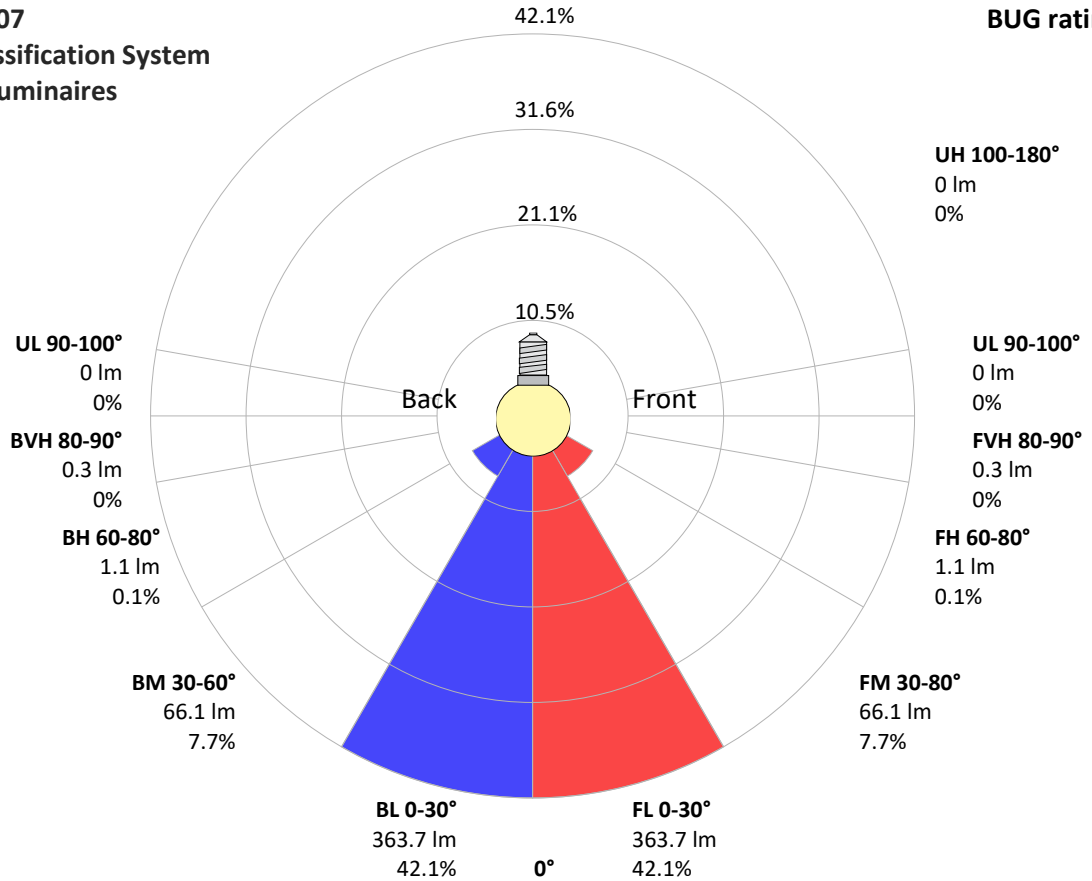
	Lumen	% Total
Forward light		
Low(0-30°)	364 lm	42.1%
Medium(30-60°)	66 lm	7.7%
High(60-80°)	1 lm	0.1%
Very high(80-90°)	0 lm	0.0%
Back light		
Low(0-30°)	364 lm	42.1%
Medium(30-60°)	66 lm	7.7%
High(60-80°)	1 lm	0.1%
Very high(80-90°)	0 lm	0.0%
Uplight		
Low(90-100°)	0 lm	0.0%
High(100-180°)	0 lm	0.0%

Intensity peaks

Max intensity	2311 cd
Intensity, 90°	0 cd
Intensity, 0°	2308 cd

IESNA TM-15-07
Luminaire Classification System
For Outdoor Luminaires

BUG rating B1 U1 G0



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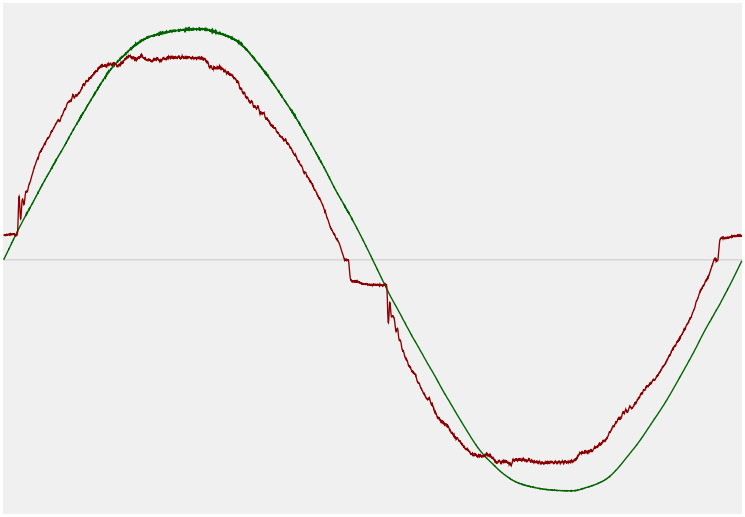
Power Details

Input Power

Power feed to light source	15.8 W
Frequency of input power	50 Hz
RMS Input voltage feed, V_{RMS}	242 V
RMS Input current feed, I_{RMS}	0.067 A
Volt-Ampere or apparent power = V_{RMS}*I_{RMS}	16.12 VA
Displacement factor of AC power feed	0.98
Power factor of AC current feed	0.98
Total harmonic distortion of the current	6.23%
Total harmonic distortion of the voltage	1.42%

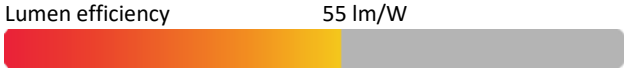
Input Power Curve



Efficiency

Radiated power efficiency 20.0%

Lumen efficiency 55 lm/W



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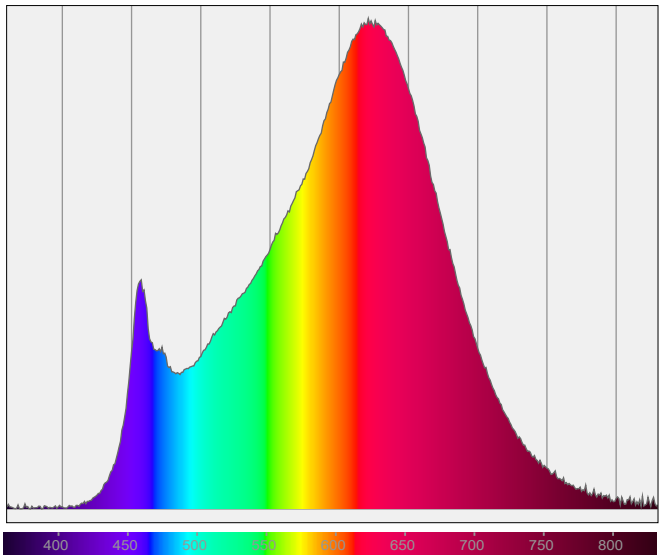
Color Measurements

Correlated Color Temperature	CCT = 2700 K
Color Rendering TM30-18	R_f 91.4 – R_g 98.9
Color Shift, CIE duv	Duv ±0.0003

Spectral distribution



Color details

Correlated Color Temperature	CCT = 2700 K	Color coordinates CIE 1931	(x;y) = (0.460;0.411)
Color Rendering Index	CRI 92.8	Color coordinate CIEs 1960	(u;v) = (0.263;0.352)
Color Rendering Index, R9 (red component)	R9 = 66.7	Color deviation from BBL	Duv = ±0.0003
Color Rendering TM30-18	R_f 91.4 – R_g 98.9	Color coordinate CIEs 1976 (CIELUV)	(u';v') = (0.263;0.263)
Color Quality Scale	CQS = 90.6		

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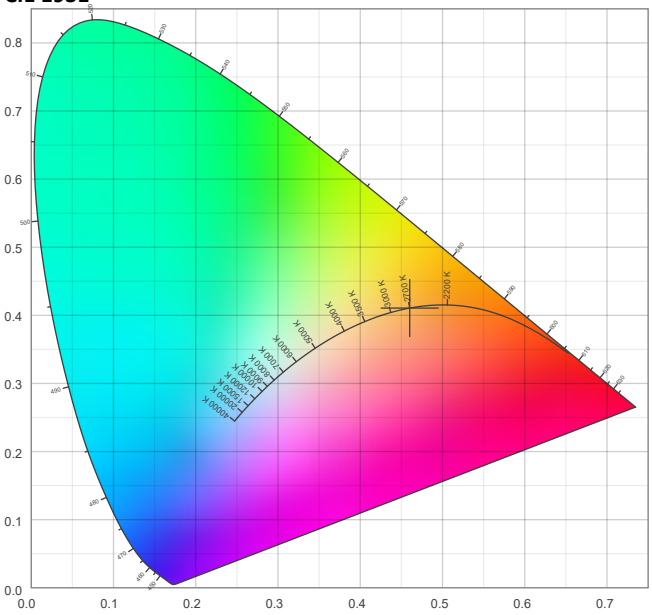
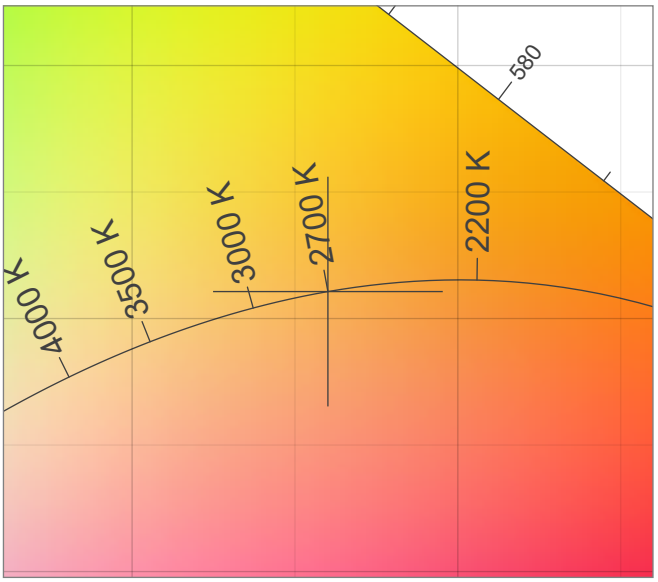
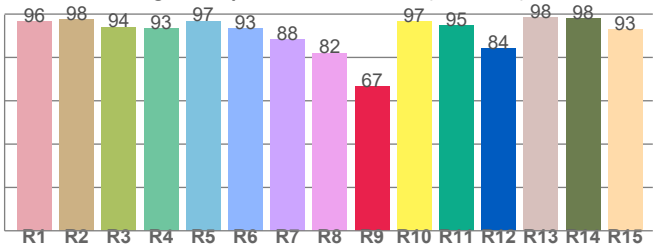
CIE 1931



CIE 1931 – zoomed on Planckian locus



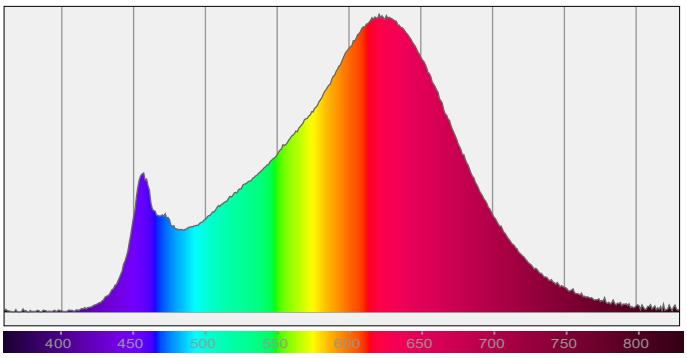
Color Rendering Index per reference color (CIE 1995)



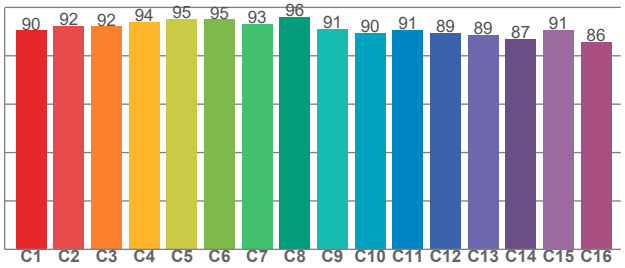
CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
96.5	97.7	94.1	93.2	96.9	93.2	88.5	82.1	66.7	96.7	94.6	84.2	98.4	97.9	93.0

Spectral power distribution (SPD) / W/nm – 0-100%



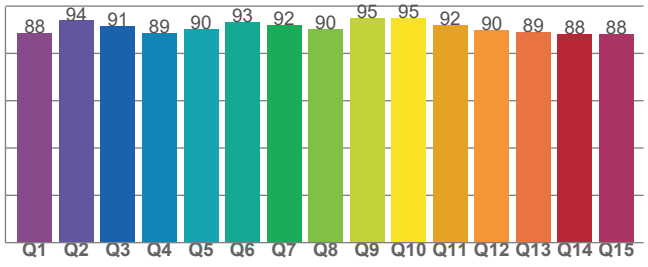
TM30-18 Rf-values per hue bin



TM30 C values, 16 binned values out of total of 99 C values

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
90.4	92.4	92.1	93.9	95.2	95.0	93.2	95.9	91.2	89.5	90.7	89.5	88.7	87.0	90.7	85.5

Color Quality Scale by reference color



CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
88.5	93.9	91.4	88.6	90.1	93.0	91.9	90.1	94.7	95.0	92.1	89.9	89.2	88.1	88.2